Gerrymandering Worksheet #1b
Traditional Tradeoffs
Extended Version

AMERICAN
MATHEMATICAL
SOCIETY

AMS Engaged Pedagogy Workshop
Mathematical Foundations for
Democratic Processes

Introduction: One of the difficult aspects in analyzing redistricting plans is that the rules that are supposed to determine the properties of a good plan are often in conflict. This is particularly true when a single plan must be selected from a finite collection of proposed plans, since on many metrics the plans might vary in strength.

Goal(s): Build intuition for the ways that districting criteria interact. Understand the limits of mathematics in application to this social problem.

Activity: When a court is evaluating multiple plans they frequently request that each plan be measured under a variety of metrics. This is sometimes called (in a pejorative sense) a beauty contest, where the plans with better scores are preferred. However, as we've frequently seen the scores may be in tension with one another and may also vary district to district with no convenient method for summarizing the overall results[1]. This is exacerbated when multiple experts are involved, each of whom may use their own underlying data, their own operationalization of the metrics, their own choice of which metrics to apply, and their own interpretation of the relative importance of each metric, among many other variables.

Start by trying to find a recent court case in your state or another state that interests you where there are publicly available expert reports. As an example, the following two documents contain many measurements of compactness, population balance, municipality splitting, partisan fairness, and other metrics for plans considered in redistricting litigation in Wisconsin and Pennsylvania in 2021.

Once you've found some reports, consider the values presented in the tables to determine which map 'should' be selected. Try to consider how you might argue (and how you might support your argument with quantitative reasoning) for your chosen map. If you were able to find reports from multiple experts analyzing the same set of maps, do some comparison of the values that were reported for the same metrics. How do they compare?

Discussion Questions: Once you've completed the exercise, use the following questions to reflect on this exercise (we'll also discuss them together in a little bit):

1. Which metrics seemed most important?

2. Did the range of observed values on the metric influence your decision?

3. Which plan did you select/discard first? Why?

4. Why is the plan you picked the 'fairest' one?

5. If you had been an expert in the case, what metrics would you have relied on? Why?

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[1] One approach, following the theme of this workshop, might be to take the rankings over the metrics as a kind of preference schedule and use the social choice methods for determining the 'winner.'